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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,918	08/09/2006	Esther Breuning	14113-00042-US	2477

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EXAMINER	
BOHATY, ANDREW K	
ART UNIT	PAPER NUMBER
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MAIL DATE	DELIVERY MODE
08/07/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,918	BREUNING ET AL.	
	Examiner	Art Unit	
	Andrew K. Bohaty	4132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2006/08/09, 2008/01/22*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 6, 7, 19, and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Regarding claim 6, the claim is indefinite because formula (B) does not further claim 5, which in turn would not further claim 3. Since formula (B) can be the only compound present, it would mean the compound would not comprise of P, As, Sb, or Bi, which is required in claims 3 and 5. The claim will be as interrupted as either a matrix material of formula (A) or formula (B) can be present even though formula (B) does not need to comprise of P, As, Sb, or Bi.

3. Claims 7 and 31 are rejected as being dependent on claim 6.

4. Regarding claim 19, the phrase "discrete molecular or coordinative compounds which also form discrete structures in the solid state" is indefinite. It is unclear with the applicants is claiming. It is unclear is the applicants means compounds that are not salts and not polymers or if they mean something different. The claim will be as interrupted as claiming a matrix material that is a non-polymer and a non-salt. Further clarification/correction is needed.

5. Appropriate attention is required.

Claim Rejections - 35 USC § 102

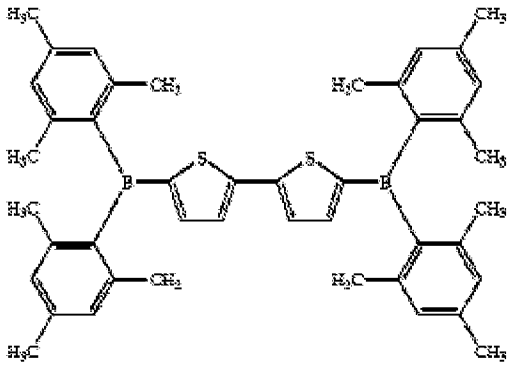
6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

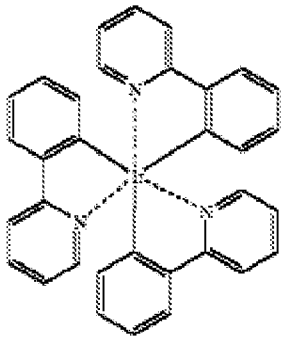
7. Claims 1, 2, 4, 10-14, 18, 19, 21-23, 25-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuura et al. (US 2003/0157366) (hereafter "Matsuura").

8. Regarding claims 1, 2, 4, 14, 18, 19, 22, and 23, Matsuura discloses an organic electroluminescent element (abstract) that contains host compound (matrix material) (see below) that contains a sulfide (abstract, paragraph [0085], page 8 compound 3-1) and an iridium containing phosphorescent material (see below, compound Ir-1, page 4) (abstract, paragraph [0068]) (claim 1). Although Matsuura does not call the host a matrix material, it performs the same function as the claimed matrix material; therefore, the host compound is also a matrix material. The sulfide compound (matrix material) disclosed by Matsuura comprises a main-group element (S) (claims 2 and 4) and is uncharged (claim 14). The sulfide compound (matrix material) of Matsuura is a non-polymer and a non-salt and Matsuura discloses that the luminescent layer made from the sulfide compound contains higher order structures when the layer is formed (paragraph [0095]). Although not explicitly disclosed by Matsuura the sulfide fragment of the molecule of Matsuura does contain a dipole moment, it is well known in the art that asymmetric compounds, such as sulfides, inherently have dipole moments (claim

18). The iridium phosphorescent material disclosed by Matsuura comprises iridium (claim 23), which as an atomic number of 77 (claim 22).



(3-1)



(Ir-1)

9. Regarding claims 10 and 11, although it is not directly disclosed by Matsuura that the triplet energy of the sulfide compound is between 2 and 4 eV and the triplet energy of the sulfide compound of the sulfide compound is greater than the triplet energy of the iridium phosphorescent material, Matsuura does disclose the iridium phosphorescent material can dope the sulfide compound (abstract, paragraphs [0085] and [0068]) and the iridium phosphorescent material emits green light (paragraph [0143]) and it is inherent that if the dopant (phosphorescent material) emits light from the visible spectrum (green light) the host material (sulfide compound) would have a triplet energy between 2 and 4 eV and the triplet energy would be greater than the triplet energy of the phosphorescent material.

10. Regarding claims 12 and 13, Matsuura discloses the T_g of the host material (matrix material) in the emitting layer is no less than 100° C (paragraph [0102]); although Matsuura does not disclose the host material (matrix material) is amphorous, Matsuura does disclose the material is thermally stable (paragraph [0102]) it is well

known in the art that thermally stable materials are inherently amphorous because cyrstalline materials are not thermally stable.

11. Regarding claim 21, Matsuura discloses the light emission layer, which includes the host material (matrix material) and phosphorescent material, can be formed as a thin layer by a vacuum deposition method and a spin-coat method (paragraphs [0095], [0132] and [0133]).

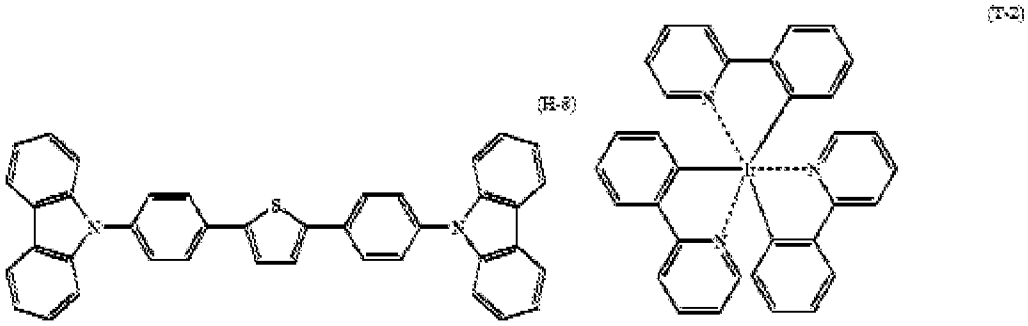
12. Regarding claims 25 and 26, Matsuura discloses at the light emission layer is formed by a combination of a host material and a phosphorescent material (paragraphs [0138] and [0140], table 1), which are deposited at two different rates (host 0.1 nm/sec, phosphorescent material 0.01 nm/sec) the two material are similar is weight (662.60 g/mol for compound 3-1, table 1, and 654.78 g/mol for Ir-1), so the weight % is about the same of the rate at which the two materials were deposited and in this case the rate as 10:1 host to phosphorescent material meaning the weight % was about 90% (host, matrix material) and 10% phosphorescent material, which is between the amounts claimed in claims 25 and 26).

13. Regarding claims 27 and 28, Matsuura discloses the organic EL element further comprises any of these layers, hole transporting layer and electron transporting layer, in addition to the light emission layer and the anode and cathode (paragraph [0088]).

14. Regarding claims 29 and 30, Matsuura discloses the light emission layer is directly adjacent to the electron-transport layer without the use of a hole-blocking layer and directly adjacent to the anode without use of a hole transporting layer and a hoe injecting layer (paragraph [0092]).

15. Claims 1, 2, 4-7, 10, 11, 14, 18, 21-25, 27, 28, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al. (US 2003/0218418) (hereafter "Sato").

16. Regarding claims 1, 2, 4, 5, 6, 7, 14, 18, 22, 23, and 31, Sato discloses an organic electroluminescent device comprising a light-emitting layer sandwich between an anode and cathode, wherein the light-emitting layer comprises a host material (matrix material) and a compound capable of phosphorescence emission (light emission from the triplet state) (abstract). Sato discloses the host as sulfide containing compounds (page 6, compound H-8 (see below), paragraph [0074] and compound H-105, Table 1, paragraph [0122]). The sulfide containing compound, H-8, is a material that contains a main group element (claim 2), S (claim 4), wherein the S is substituted with two aromatic groups (claim 5). Compound H-8 is a compound of formula (B) (claims 6 and 31) where Y is S and Ar is a substituted aromatic ring, more specifically a phenyl ring (claim 7). Both H-8 and H-105 are uncharged compounds (claim 14). Although not explicitly disclosed by Sato the sulfide fragment of the molecule of Sato does contain a dipole moment, it is well known in the art that asymmetric compounds, such as sulfides, inherently have dipole moments (claim 18). The iridium phosphorescent material disclosed by Sato comprises iridium (claim 23) (paragraph [0150], page 30 compound T-2), which as an atomic number of 77 (claim 22).



17. Regarding claims 10 and 11, Sato discloses the host material (matrix material) has a excited triplet level in an energy state higher than the excited triplet level of compound A (phosphorescent material) (claim 11). Although it is not directly disclosed by Sato that the triplet energy of the sulfide compound is between 2 and 4 eV, Sato does disclose the phosphorescent material (T-2) can dope the sulfide compound (H-8) (abstract, paragraph) and the iridium phosphorescent material emits green light (paragraph [0010]) and it is inherent that if the dopant (T-2) emits light from the visible spectrum (green light) the host material (H-8) would have a triplet energy between 2 and 4 eV (claim 10).

18. Regarding claim 21, Sato discloses the light-emitting layer can be formed by a vapor deposition method (paragraphs [0176] and [0184]).

19. Regarding claim 24, Sato discloses the light-emitting layer may contain two phosphorescent materials (light emitters from the triplet state (abstract, compound A and compound B).

20. Regarding claim 25, Sato discloses the main component (host or matrix material) occupies 50% by weight or more of the light-emitting layer; while the total compound A and compound B is less than 50% by weight of the light-emitting layer (paragraph

[0048]). This values falls within the claimed values of 99 to 1% by weight and 1 to 99% by weight of the two different components.

21. Regarding claims 27 and 28, Sato discloses the organic electroluminescent device can contain other layers besides the light-emitting layer, anode and cathode and these layers include a hole-transporting layer, hole-blocking layer and electron-transporting layer (Fig. 2 objects 4, 6, and 7, paragraph [0178]).

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

23. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

24. Claims 5-7 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuura et al. (US 2003/0157366) (hereafter “Matsuura”) as applied to claims 1, 2, 4, 10-14, 18, 19, 21-23, and 25-30 above.

25. Regarding claims 5-7, Matsuura does not specifically teach a host (matrix material) that contains a S containing compound wherein the S is substituted with at least one substituted or unsubstitued aromatic or herearomiatic ring system.

26. Matsuura does teach that a general formula (formula (2), paragraph [0022]) can be used as a host material, wherein A can be selected from a group and where one of the possibilities of compounds A is diphenyl sulfide (paragraph [0075]) to provide an organic electroluminescence element providing high emission luminance and long emission lifetime (paragraph [0011]). This would produce a S containing compound of formula (B) where Y is S and Ar are substituted phenyl groups (aromatic ring).

27. It would have been obvious to one of ordinary skill in the art at the time the invention was made, to select a host material (matrix material) that contains diphenyl sulfide, to make an organic electroluminescent device, wherein the emission layer contains a S containing compound wherein the S is substituted with two substituted phenyl rings. Matsuura teaches the use of host materials with phosphorescent materials and furthers teaches the host material of general formula (2) can contain diphenyl sulfide. The motivation would have to provide an organic electroluminescence element providing high emission luminance and long emission lifetime.

28. Regarding claims 15-17, Matsuura does not specifically teach the LUMO and HOMO values of the host (matrix material) and the phosphorescent material.

29. Matsuura does teach the use of a phosphorescent dopant in a host material (abstract) to obtain an organic electroluminescent element providing high emission luminance and long emission lifetime (paragraph [0011]).

30. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the HOMO and LUMO values of the host material (matrix material) and phosphorescent material of Matsuura to be characterized in that the LUMO of the host material is higher than the HOMO of the phosphorescent material and the LUMO of the phosphorescent material is higher than the HOMO of the host material; the HOMO of the compound having the less negative HOMO in the emission layer is in the region of ± 0.5 eV of the HOMO of the layer adjacent to the emission layer on the anode side; and that the LUMO of the compound having the more negative LUMO in the emission layer is in the region of ± 0.5 eV of the LUMO of the layer adjacent to the emission layer on the cathode side to further optimize the luminescence properties of the material.

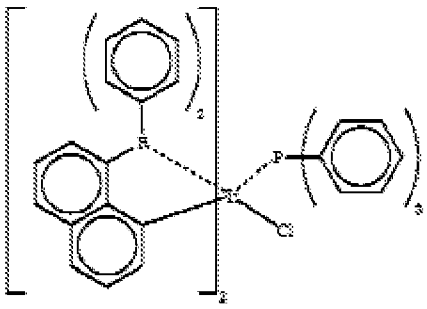
31. Claims 3, 5-9, 20, 24, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuura et al. (US 2003/0157366) (hereafter "Matsuura") as applied to claims 1, 2, 4, 10-14, 18, 19, 21-23, and 25-30 above, and further in view of Igarashi et al. (US 2002/0048689) (hereafter "Igarashi").

32. Regarding claims 3, 5-8, and 31, Matsuura does not teach a host material (matrix material) that comprises phosphorus, arsenic, antimony and/or bismuth.

33. Igarashi teaches a light emitting device (abstract) containing an anode (paragraph [0093]) and cathode (paragraph [0097]) and a light emitting layer (abstract), wherein the light emitting layer comprises a phosphorus containing material as host materials (abstract, paragraphs [0032]-[0035], and [0042], compound 1-34(see below)).

Igarashi teaches the phosphorus material can compose anywhere between 0.1% to 100% by weight of the total light emitting layer (paragraph [0042]) and further teaches the layer can comprise of a plurality of compounds, indicating the phosphorus containing material can be a host (matrix material) (paragraph [0101]). The compound 1-34 taught by Igarashi is of formula (A) wherein X is P (claims 6 and 31) and all the Ars are all phenyl groups (claim 7), unsubstituted aromatic rings (claims 5, 6, and 31). The compound 1-34 further comprises Ir, which is a transition metal (claim 8). Igarashi teaches the phosphorus containing compound to provide a light-emitting device with a high efficiency (paragraph [0005]).

(1-34)



34. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the emission layer of Matsuura to contain the phosphorus containing material (1-34) taught by Igarashi to create a host material (matrix material) that contains phosphorus and three unsubstituted phenyl groups as substituents and a transition metal. The motivation would have been to provide a light-emitting device with a high efficiency.

35. Regarding claim 9, Matsuura does not teach a mixture of host materials (matrix material).

36. Igarashi teaches that the light emitting layer may be comprised of a plurality of compounds (paragraph [0102]), which means the light emitting layer may comprises of more than one host material (matrix material) to provide a light-emitting device with a high efficiency (paragraph [0005]).

37. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the emission layer of Matsuura to multiple matrix materials. The motivation would have been to provide a light-emitting device with a high efficiency.

38. Regarding claim 20, Matsuura does not teach a host (matrix material) which can itself also emit light from the triplet state

39. Igarashi teaches phosphorus containing materials (abstract, paragraphs [0032]-[0035], and [0042], formula (5) and formula (6), compound 1-34) which can be used as host materials (see explanation above). Igarashi further teaches that the light emitting material can comprise materials that emit light from the triplet state (paragraph [0100]) and teaches a compound that shows phosphorescent (paragraph [0116]). Igarashi teaches the phosphorus containing compound to provide a light-emitting device with a high efficiency (paragraph [0005]). Although Igarashi does not directly teach a phosphorus containing compound that meets the limitations of claim 1, Igarashi does teach phosphorus containing compounds that also contain Ir emit light from the triplet state, Igarashi also teaches two general formulae (formulae (5) and (6), paragraphs [0032—[0035]) that can be used to create phosphorus containing materials that could emit light from the triplet state.

40. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select a phosphorus containing compound of Igarashi that emits light from the triplet state to modify the matrix material of device of Matsuura to compose a device that contained a host material that emitted light from the triplet state. The motivation would have been to provide a light-emitting device with a high efficiency.

41. Regarding claim 24, Matsuura does not teach that the light emission layer can comprise a mixture of phosphorescent materials.

42. Igarashi teaches that the light emitting layer may be comprised of a plurality of compounds (paragraph [0102]), which means the light emitting layer may comprises of more than one phosphorescent materials (triplet emitters) to provide a light-emitting device with a high efficiency (paragraph [0005]) and ability to produce white light (paragraph [0102]).

43. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify to emission layer of Matsuura to contain a mixture of at least two triplet emitters. The motivation would have been to provide a light-emitting device with a high efficiency and the ability to produce white light.

Conclusion

44. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

45. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael LaVilla can be reached on (571)272-1539. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

46. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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